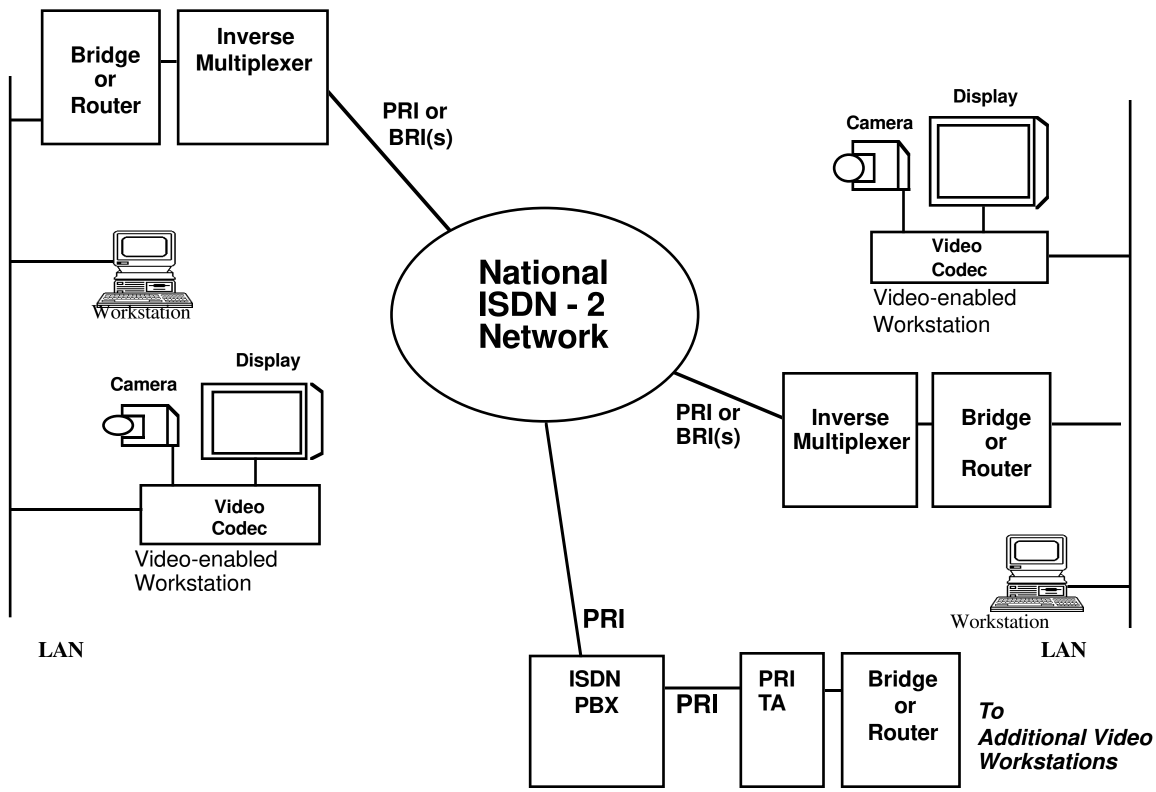
3.3.5 PRI Videoconferencing

A LAN-based desktop video conferencing system can be extended to remote sites using ISDN PRI to provide both video conferencing and LAN-to-LAN connectivity for other applications. An Inverse Multiplexer aggregates bandwidth for transport of the combined LAN and video/LAN traffic. Multiple remote locations are supported by using LAN addressing and routing information to determine to which of several directory numbers to connect.

Configuration:



How It Works:

With the addition of a video camera, appropriate software, a codec board and multi-media board, a PC or workstation can function as a desktop video conferencing system. The workstations are connected to a LAN. A bridge/router and Inverse Multiplexer is also connected to the LAN. Remote users also have video enabled workstations. The video data generates 112-384 kbps and is combined with other LAN traffic. At each remote location, a bridge/router or small BRI LAN Bridge can initiate access to or respond to access from another location. On receipt of a remote LAN packet, the Inverse Multiplexer establishes one or more circuit switched data connections to the remote location. Alternatively, network-based SWF-DS1 (Multirate ISDN) can be used to establish Nx64 connections. The appropriate DNs are determined by the LAN routing and addressing information.

Obtain Equipment with These Capabilities

Video enabled workstation:

- Codec Board, Multimedia Board, and software, NTSC or PAL Camera
- H.261 Compression and LAN encapsulation software.

Router/Bridge

- Compatible interfaces with Local LANs (e.g., Ethernet, Token Ring)
- Router (or Bridge) functions compatible with LAN Operating Systems and personal computer communications software
- Automatic dialing of peer Router based on destination address from LAN protocol
- High speed serial interface (e.g., V.35) at 384 Kbps.

Inverse Multiplexer/PRI Terminal Adapter

- Inverse multiplexing function to form N x 64k (56k) channel from N individual 64k (56k) circuit-data calls.
- Alternatively, SWF-DS1 (Multirate ISDN) on a PRI, placing a single 384 Kbps call
- The Inverse Multiplexer or PRI TA can connect to the network through a PBX, or a multiplexer.
- Support one or more directory number values for use with circuit-data calls
- Support Calling Number Identification Services for circuit-data calls

Private Branch Exchange (PBX)

- Support simultaneous voice and data access to the network.
- Support a PRI interface for connection to the PRI TA

Request These Capabilities From ISDN Service Provider

Network Interface to Inverse Multiplexer or PRI TA - PRI

- One 23B+D PRI
- Directory Numbers (DNs) as required by Inverse Multiplexer or PRI TA
- B channels with:
  - Circuit-Data
  - SWF-DS1 (Multirate ISDN)
- Features for Circuit-Data
  - None required
  - Optional Calling Number Identification Services.

Network Interface to Inverse Multiplexer - BRI

Network Services Required:

- One or more BRI. (2B)

For each BRI:

- Two B channels for circuit-data calls. If using NI-1, this requires two circuit-data DNs and SPIDs.
- Circuit-Data Features:
  - None required. (See Technical Note)
  - Optional Calling Number Identification Services.

Subscription or Ordering Information:

- This interface is configured for two simultaneous circuit-data calls (NIIG 14). Other NIIGs which have this functionality include 15, 17, 24, 25, and 27.
- Parameter Groups for Circuit-Data Features:
  - None required. (See Technical Note)
  - A la carte: Calling Number Identification Services (Optional)

Network Interface to PBX

- One 23B+D PRI.
- Directory Numbers (DNs) as required by Inverse Multiplexer or PRI TA
- B channels with:
  - Voice
  - Circuit-Data
  - SWF-DS1 (Multirate ISDN)
- Features for Voice, Circuit-data, & SWF-DS1:
  - None required
  - Optional Calling Number Identification Services.

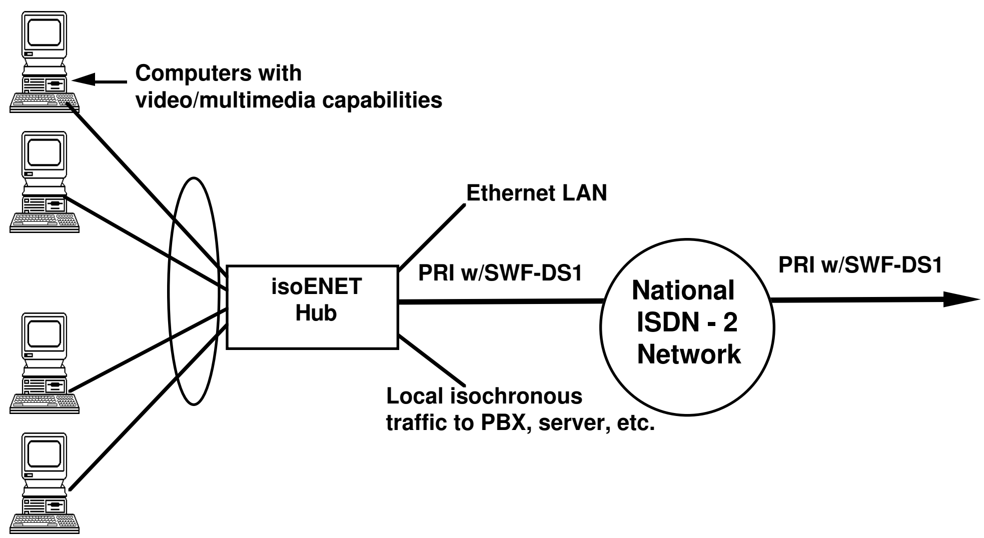
Technical Notes

- The Inverse Multiplexer can utilize a PRI or multiple BRI line network access. The choice of interface will depend chiefly on the total required bandwidth and economics of the services and related CPE (NT-1's, CSU, etc.) -- the services are functionally identical in this application.
- By using PRI with SWF-DS1 (Multirate ISDN), the router can (through a PBX, multiplexer or communications controller) use a single nx64 channel provided by the network. More information on high bandwidth configurations may be found in Section 5.1.9.
- ISDN Bridge/Router Inverse Multiplexers need to use compatible protocols for framing MAC layer packets (e.g., ethernet packets) onto ISDN circuit-data, and compatible protocols for inverse multiplexing.
- Multiple remote locations (LANs) can be supported simultaneously with additional ISDN and/or dedicated interfaces.
- ISDN Supplementary Services: Calling Number Identification may be used to provide additional security to the bridges and routers.
- Inverse multiplexing equipment on Basic Rate Interfaces may require a la carte feature ordering to allow callers to place multiple circuit-data calls using a single DN as shown in 3.1.11.
- For details on subscription and ordering information using NIUF ISDN Interface Groups (NIIGs) and NIUF ISDN Parameter Groups (NIPGs), see Section 5.1.11. (BRI only)
- For detailed signaling flow diagrams, see Sections 5.2.1.5 (Circuit-data Call Setup), 5.2.1.6 (Circuit-data Call clearing), 5.2.3.4 (Circuit-data Call Setup), 5.2.3.7 (Multirate Call Setup), and 5.2.3.8 (Call clearing).

3.3.6 Multimedia desktop video via isochronous Ethernet and SWF-DS1

A new technology that is designed to provide multimedia communications directly over LANs and the public switched network is being termed isochronous Ethernet (isoENET™). isochronous Ethernet is an evolutionary technology upgrade from 10BASE-T Ethernet. This will allow users of existing 10BASE-T networks to add isochronous services, such as desktop videoconferencing and multimedia communications, as their needs require, without disturbing their existing Ethernet networks. 10BASE-T nodes can be connected to an isoENET hub that is supporting isochronous services and operate transparently. The isoENET hub can then be connected to PRI with SWF-DS1 to support seamless multi-party videoconferencing across a wide area. During call set-up, the caller may request as many B-channels as are required.

Configuration:



How It Works:

To set up a video conference, which may include parties both within the local area and across the ISDN network, one user calls another by dialing their video address and choosing the desired bandwidth. This example shows a PRI line with SWF-DS1 capabilities (Multirate ISDN) connecting to an isoENET hub that connects to many multimedia computers using isochronous ethernet. Depending on the desired bandwidth for the videoconference, users can select from a bandwidth of 128 to 1536 kbps (n = 2 to 24) on a per-call basis. Generally, the quality of the picture and sound improve with more bandwidth.

The videoconferencing computer consists of a display and camera; microphone and speakers; and possibly a control panel. Systems can include fax, imaging, and overhead display capabilities for sharing text and graphics. The video signal is transmitted over multiple B-channels to the isoENET hub. As part of the system, the isoENET hub places the call onto multiple B-channels and sends them into the network. With SWF-DS1, the network passes the multiple 64 kbps channels as one stream and performs the synchronization within the network.

Obtain Equipment with These Capabilities

Video / Multimedia Terminals

- Display, speaker, camera, microphone, & control panel integrated at the computer.
- Video and audio signal encoding and decoding compatible with far end. Standards are H Series (sometimes called "P x 64"), with H.261 video compression.
- Each terminal must have an isoENET adapter card.

isoENET Hub

- IsoENET upgrade to the 802.3 Ethernet controller
- Split and combine P x 64 kbps signals from a PRI into a single stream to be managed by the network. Standards are H Series.
- Call control for PRI using SWF-DS1 (Multirate ISDN).
- Optional calling number display.
- Interface compatible with 10BASE-T Ethernet

Request These Capabilities From ISDN Service Provider

Network Interfaces to isoENET hub

- One 23B+D PRI.
- Directory Numbers (DNs) as required by hub.
- B channels with:
  - Circuit-data.
  - SWF-DS1 (Multirate ISDN)
- Features for Circuit-Data and Multirate Circuit-data:
  - None required.
  - Calling Number Identification Services (Optional).

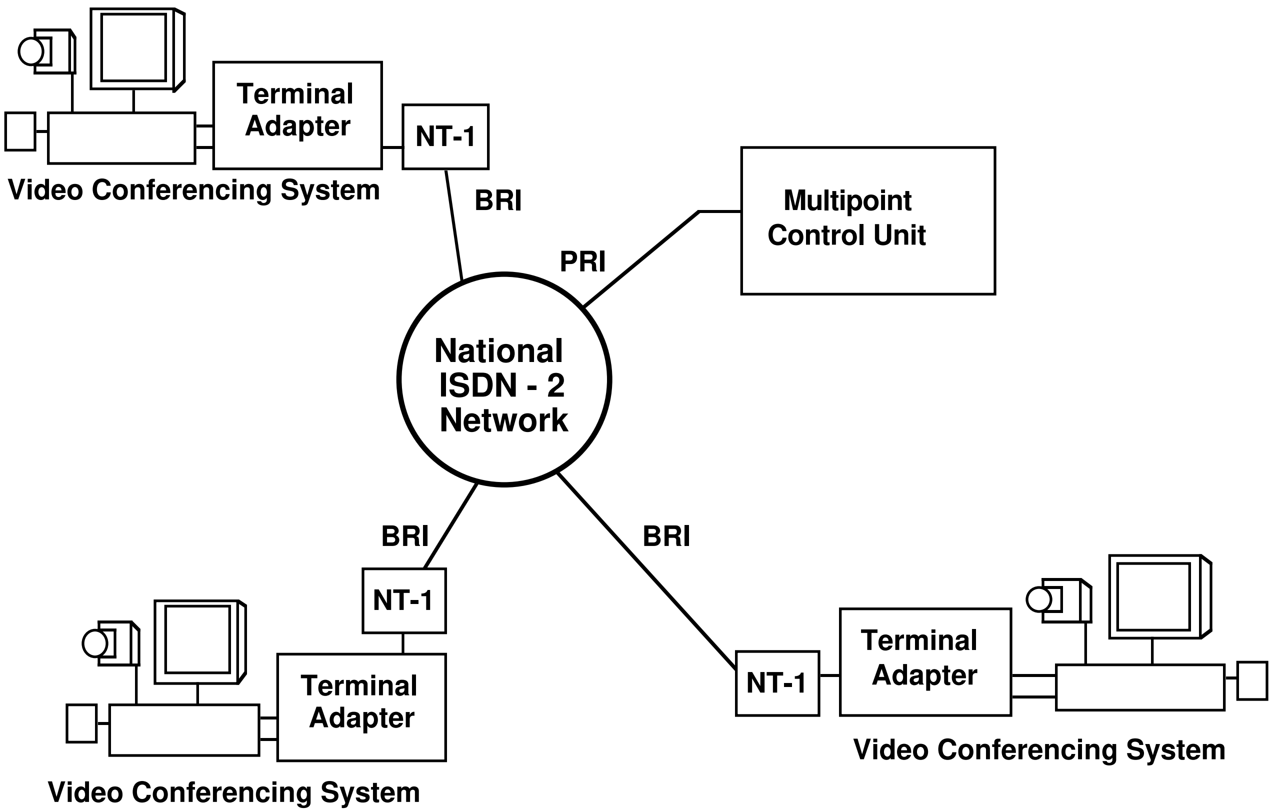
Technical Notes

- Isochronous Ethernet (isoENET) technology is a trademark of National Semiconductor and IBM, but the technology is now being standardized by the iEEE 802.9 committee.
- Isochronous Ethernet adds an additional 6.144 Mbps of isochronous bandwidth to existing 10 Mbps 10BASE-T Ethernet. The isochronous bandwidth is divided into 96 64 kbps ISDN-B channels, a D-channel for signaling and control, a maintenance channel, and an 8 KHz frame alignment signal.
- The hub provides P x 64 connections to user applications by providing the functionality necessary to interface to the public network. This guide demonstrates the use of SWF-DS1.
- For detailed Signaling Flow Diagrams for this application, see Sections 5.2.3.7 (SWF-DS1 Call Setup), and 5.2.3.8 (Voice, Circuit-Data, and SWF-DS1 Call Clearing).

3.3.7 Multipoint videoconferencing

Colleges, universities, high schools, and educational/training businesses can extend the classroom environment electronically to many distant sites using video conferencing technology over ISDN access lines. Thus, more services can be offered to wider educational audiences at lower costs.

Configuration:



How It Works:

Video conferencing systems at each site dial into the Multipoint Control Unit (MCU). The MCU automatically manages voice and video to each site to present a "conference room" environment to participants. Depending on MCU features, the call can be set up with split screens, so every room is shown, or with the speaker's video taking up the entire screen at each listening site. In the set-up shown, each class room uses two 64 kbps circuit-data calls to the MCU. If a site does not have access to ISDN lines, it uses two Switched 56 lines to establish two 56 kbps circuit-data calls to the MCU. The MCU connects with each site using a PRI with 23 available 64 kbps channels.

Obtain Equipment with These Capabilities

Multipoint Control Unit (MCU)

- Manage multipoint video conference with up to n sites, with video and audio coding that is compatible with all sites.
- Split and combine n x 64 kbps channels and place them onto the PRI. This example uses H.221 for inverse multiplexing.

Video Conferencing Systems

- Camera, display, speaker, microphone, & control panel.
- Video and audio signal encoding and decoding compatible with far end. Standards are CCITT H.261 (sometimes called "p by 64").
- Compatibility with MCU.
- Audio-Video interface to Terminal Adapter, with
  - dual 56/64 kbps ports (V.35 or RS-449)
  - synchronization of data on ports compatible with far end
  - inverse multiplexer function to convert coded data into 2 separate streams, & vice versa
  - support dialing using control interface (e.g., RS-366) from Control Panel.

ISDN Terminal Adapter

- B channel capabilities:
  - Simultaneous circuit-data calling on two B channels.
  - Support dialing using control interface (e.g., RS - 366)
  - If using NI-1, support for one Directory Number (DN) and Service Profile ID (SPID) will be needed.
- Physical interfaces:
  - Audio-Video interface to Video Conf. System with dual 56/64 kbps ports (V.35 or RS-449) .
  - RJ-45 connector to NT-1, or integrated NT-1.

Request These Capabilities From ISDN Service Provider

Network Interface to MCU

- One 23B+D PRI.
- Directory Numbers (DNs) as required by MCU.
- B channels with:
  - Circuit-data.
- Features for Circuit-Data
  - None required.
  - Optional Calling Number Identification Services.

Network Interfaces to Terminal Adapter for Video Conf. System

Network Services Required:

- One BRI. (2B)
- Two B channels for circuit-data calls, with circuit-data DNs and SPIDs.
- Circuit-Data Features:
  - Optional Calling Number Identification Services.

Subscription or Ordering Information:

- This interface is configured for two simultaneous circuit-data calls (NIIG 14). Other NIIGs which have this functionality include 15, 17, 24, 25, and 27.
- Parameter Groups for Circuit-Data Features:
  - None required.
  - A la carte: Calling Number Identification Services.

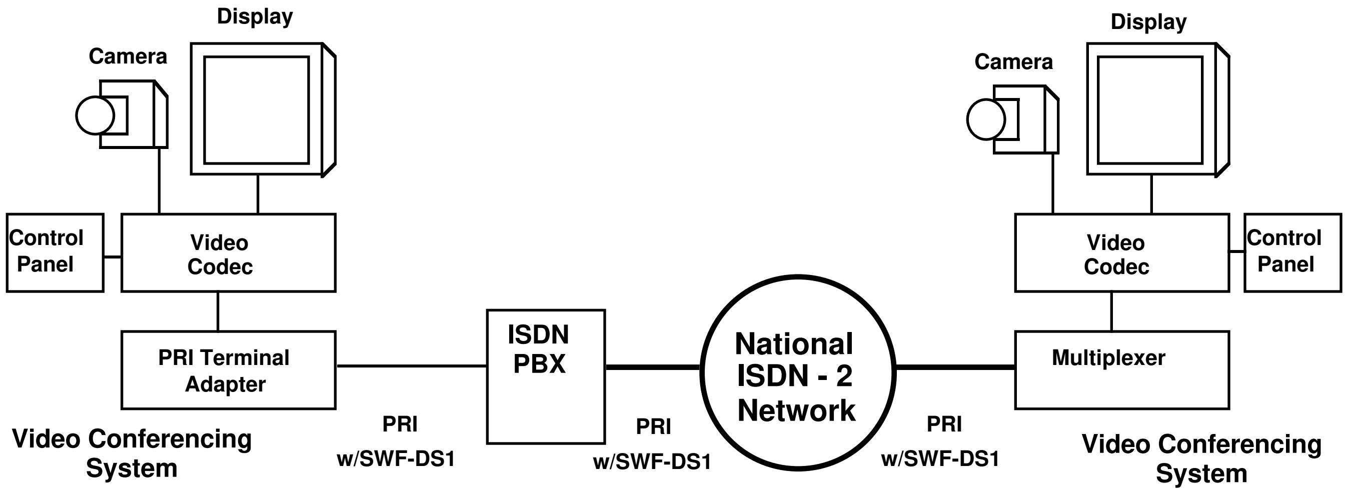
Technical Notes

- Although not critical for this application, Calling Number Identification Services may help coordinate calling and called Directory Numbers at the inverse multiplexers.
- Existing Video Conferencing solutions can be modified to work with ISDN by adding Terminal Adapters to them. If the existing solution already contains an Inverse Multiplexer, then the TA only needs to support basic ISDN signaling and physical layer functions.
- For details on subscription and ordering information using NIUF ISDN Interface Groups (NIIGs) and NIUF ISDN Parameter Groups (NIPGs), see Section 5.1.11.
- See Sections 5.2.1.5, 5.2.1.6, and 5.2.3.4 for detailed Signaling Flow Diagrams.

3.3.8 Videoconferencing facilities

ISDN can be used to link video conference systems that support real time video, audio, and document communication. People can cut down on travel, while still meeting "face to face." These links are established only as required, saving the cost of leased lines for lower traffic volumes. SWF-DS1 (Multirate ISDN) also provides the flexibility to roll the video system to anyplace where there are appropriately configured ISDN access lines.

Configuration:



How It Works:

To set up a video conference, one user calls another by dialing with their multiplexer or conferencing system control panel. This example shows a PRI line with SWF-DS1 capabilities, which will allow users to select bandwidths from 128 to 1536 kbps in 64 kbps increments on a per call basis. Generally, the quality of the picture and sound improve with more bandwidth.

The video conferencing system consists of a display and camera; microphone and speakers; control panel, video codec, and multiplexer. Some systems support options for fax, imaging, and overhead display capabilities for sharing text and graphics. The codec compresses the video signal from the camera for transmission and decompresses the incoming video signal from the far end for display. As part of the conferencing system, the multiplexer adapts the video signal onto a set of synchronized 64 kbps channels over the PRI. The synchronization is performed by the SWF-DS1 functionality.

Obtain Equipment with These Capabilities

Video Codec for Conferencing System

- Display, speaker, camera, microphone, & control panel.
- Video and audio signal encoding and decoding compatible with far end. Standards are H Series (sometimes called "P x64").
- Interface compatible with Multiplexer or PRI TA (e.g., V.35 at 384 kbps).
- Dialing interface from control panel to the multiplexer or PRI TA. (RS-366)

Multiplexer

- Support SWF-DS1 (Multirate ISDN) at 384 kbps.
- Optional calling number display.
- Interface compatible with Codec.(e.g., V.35 at 384 kbps)

PRI Terminal Adapter

- Support SWF-DS1 (Multirate ISDN) at 384 kbps.
- Optional calling number display.
- Interface compatible with Codec.(e.g., V.35 at 384 kbps)

Private Branch Exchange (PBX)

- Support simultaneous voice and data access to the network, plus SWF-DS-1 (Multirate ISDN) service.
- Interface compatible with PRI TA. In this case, PRI with SWF-DS1.

Request These Capabilities From ISDN Service Provider

Network Interfaces to Multiplexer

- One 23B+D PRI.
- Directory Numbers (DNs) as required by application.
- B channels with:
  - SWF-DS1 (Multirate ISDN)
- Features for Multi-rate Circuit-Data:
  - None required
  - Optional Calling Number Identification

Network Interface to PBX

- One 23B+D PRI.
- Directory Numbers (DNs) as required by PRI TA.
- B channels with:
  - Voice
  - Circuit-Data
  - SWF-DS1 (Multirate ISDN)
- Features for Voice, Circuit-data, & SWF-DS1:
  - None required
  - Optional Calling Number Identification Services.

Technical Notes

- Video conferencing systems support the H.261 standard for video coding, which supports a separate 16 kbps channel for audio that is coded in accordance with G.728.
- Although not critical for this application, Calling Number Identification Services may help coordinate calling and called Directory Numbers at the multiplexer and PRI TA.
- For detailed signaling flow diagrams, see Sections 5.2.3.7 (Multirate Call Setup), and 5.2.3.8 (Call clearing).